



US009467564B2

(12) **United States Patent**  
**Vasudev**

(10) **Patent No.:** **US 9,467,564 B2**  
(45) **Date of Patent:** **\*Oct. 11, 2016**

(54) **METHODS AND SYSTEMS FOR PARTIALLY UPDATING A WEB PAGE USING AN EMBEDDED IFRAME**

(58) **Field of Classification Search**

USPC ..... 379/265.09  
See application file for complete search history.

(71) Applicant: **salesforce.com, inc.**, San Francisco, CA (US)

(56) **References Cited**

U.S. PATENT DOCUMENTS

(72) Inventor: **Gautam Vasudev**, San Francisco, CA (US)

5,577,188 A	11/1996	Zhu
5,608,872 A	3/1997	Schwartz et al.
5,649,104 A	7/1997	Carleton et al.
5,715,450 A	2/1998	Ambrose et al.
5,761,419 A	6/1998	Schwartz et al.
5,819,038 A	10/1998	Carleton et al.
5,821,937 A	10/1998	Tonelli et al.
5,831,610 A	11/1998	Tonelli et al.
5,873,096 A	2/1999	Lim et al.
5,918,159 A	6/1999	Fomukong et al.
5,963,953 A	10/1999	Cram et al.
6,092,083 A	7/2000	Brodersen et al.
6,161,149 A	12/2000	Achacoso et al.
6,169,534 B1	1/2001	Raffel et al.
6,178,425 B1	1/2001	Brodersen et al.
6,189,011 B1	2/2001	Lim et al.
6,216,135 B1	4/2001	Brodersen et al.
6,233,617 B1	5/2001	Rothwein et al.

(73) Assignee: **salesforce.com, inc.**, San Francisco, CA (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 154 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **14/256,778**

(22) Filed: **Apr. 18, 2014**

(65) **Prior Publication Data**

US 2014/0226808 A1 Aug. 14, 2014

**Related U.S. Application Data**

(63) Continuation of application No. 13/604,356, filed on Sep. 5, 2012, now Pat. No. 8,731,151.

(60) Provisional application No. 61/594,209, filed on Feb. 2, 2012.

(51) **Int. Cl.**

**H04M 3/51** (2006.01)

**H04M 7/00** (2006.01)

**G06F 3/048** (2013.01)

(52) **U.S. Cl.**

CPC ..... **H04M 3/5133** (2013.01); **G06F 3/048** (2013.01); **H04M 7/0018** (2013.01); **H04M 7/0033** (2013.01)

(Continued)

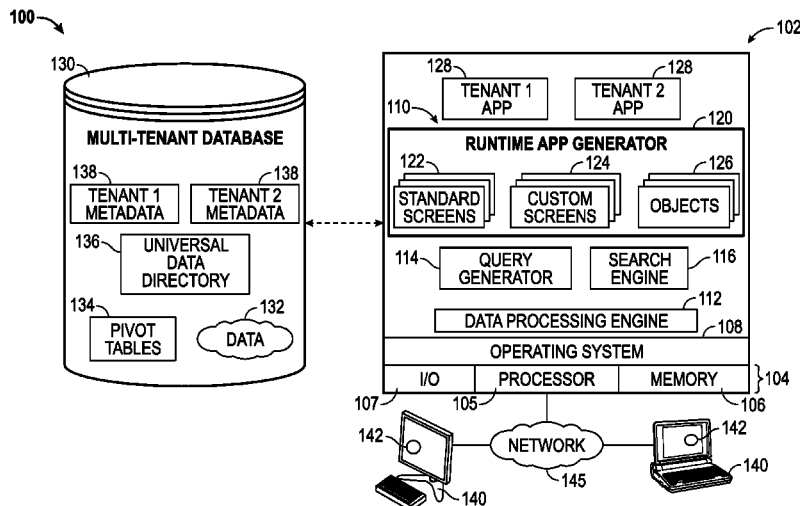
*Primary Examiner* — Amal Zenati

(74) *Attorney, Agent, or Firm* — Lorenz & Kopf LLP

(57) **ABSTRACT**

Methods and systems are provided for managing customer service calls using a localhost service operating within a desktop environment. The system includes a web-based application configured to display browser windows including an overlaid or embedded softphone component, and a desk top application which serves a telephony application configured to receive call status information from a CTI adapter. The softphone is supported by an iFrame which exchanges call status information with the desk top application.

**16 Claims, 5 Drawing Sheets**



(56)

**References Cited**

## U.S. PATENT DOCUMENTS

6,266,669 B1	7/2001	Brodersen et al.	8,457,545 B2	6/2013	Chan
6,295,530 B1	9/2001	Ritchie et al.	8,484,111 B2	7/2013	Frankland et al.
6,324,568 B1	11/2001	Diec et al.	8,490,025 B2	7/2013	Jakobson et al.
6,324,693 B1	11/2001	Brodersen et al.	8,504,945 B2	8/2013	Jakobson et al.
6,336,137 B1	1/2002	Lee et al.	8,510,045 B2	8/2013	Rueben et al.
D454,139 S	3/2002	Feldcamp et al.	8,510,664 B2	8/2013	Rueben et al.
6,367,077 B1	4/2002	Brodersen et al.	8,566,301 B2	10/2013	Rueben et al.
6,393,605 B1	5/2002	Loomans	8,646,103 B2	2/2014	Jakobson et al.
6,405,220 B1	6/2002	Brodersen et al.	2001/0044791 A1	11/2001	Richter et al.
6,434,550 B1	8/2002	Warner et al.	2002/0072951 A1	6/2002	Lee et al.
6,446,089 B1	9/2002	Brodersen et al.	2002/0082892 A1	6/2002	Raffel
6,535,909 B1	3/2003	Rust	2002/0129352 A1	9/2002	Brodersen et al.
6,549,908 B1	4/2003	Loomans	2002/0140731 A1	10/2002	Subramanian et al.
6,553,563 B2	4/2003	Ambrose et al.	2002/0143997 A1	10/2002	Huang et al.
6,560,461 B1	5/2003	Fomukong et al.	2002/0162090 A1	10/2002	Parnell et al.
6,574,635 B2	6/2003	Stauber et al.	2002/0165742 A1	11/2002	Robbins
6,577,726 B1	6/2003	Huang et al.	2003/0004971 A1	1/2003	Gong
6,601,087 B1	7/2003	Zhu et al.	2003/0018705 A1	1/2003	Chen et al.
6,604,117 B2	8/2003	Lim et al.	2003/0018830 A1	1/2003	Chen et al.
6,604,128 B2	8/2003	Diec	2003/0066031 A1	4/2003	Laane et al.
6,609,150 B2	8/2003	Lee et al.	2003/0066032 A1	4/2003	Ramachandran et al.
6,621,834 B1	9/2003	Scherpbier et al.	2003/0069936 A1	4/2003	Warner et al.
6,654,032 B1	11/2003	Zhu et al.	2003/0070000 A1	4/2003	Coker et al.
6,665,648 B2	12/2003	Brodersen et al.	2003/0070004 A1	4/2003	Mukundan et al.
6,665,655 B1	12/2003	Warner et al.	2003/0070005 A1	4/2003	Mukundan et al.
6,684,438 B2	2/2004	Brodersen et al.	2003/0074418 A1	4/2003	Coker et al.
6,711,565 B1	3/2004	Subramaniam et al.	2003/0120675 A1	6/2003	Stauber et al.
6,724,399 B1	4/2004	Katchour et al.	2003/0151633 A1	8/2003	George et al.
6,728,702 B1	4/2004	Subramaniam et al.	2003/0159136 A1	8/2003	Huang et al.
6,728,960 B1	4/2004	Loomans et al.	2003/0187921 A1	10/2003	Diec et al.
6,732,095 B1	5/2004	Warshavsky et al.	2003/0189600 A1	10/2003	Gune et al.
6,732,100 B1	5/2004	Brodersen et al.	2003/0204427 A1	10/2003	Gune et al.
6,732,111 B2	5/2004	Brodersen et al.	2003/0206192 A1	11/2003	Chen et al.
6,754,681 B2	6/2004	Brodersen et al.	2003/0225730 A1	12/2003	Warner et al.
6,763,351 B1	7/2004	Subramaniam et al.	2004/0001092 A1	1/2004	Rothwein et al.
6,763,501 B1	7/2004	Zhu et al.	2004/0010489 A1	1/2004	Rio et al.
6,768,904 B2	7/2004	Kim	2004/0015981 A1	1/2004	Coker et al.
6,772,229 B1	8/2004	Achacoso et al.	2004/0027388 A1	2/2004	Berg et al.
6,782,383 B2	8/2004	Subramaniam et al.	2004/0128001 A1	7/2004	Levin et al.
6,804,330 B1	10/2004	Jones et al.	2004/0186860 A1	9/2004	Lee et al.
6,826,565 B2	11/2004	Ritchie et al.	2004/0193510 A1	9/2004	Catahan et al.
6,826,582 B1	11/2004	Chatterjee et al.	2004/0199489 A1	10/2004	Barnes-Leon et al.
6,826,745 B2	11/2004	Coker	2004/0199536 A1	10/2004	Barnes Leon et al.
6,829,655 B1	12/2004	Huang et al.	2004/0199543 A1	10/2004	Braud et al.
6,842,748 B1	1/2005	Warner et al.	2004/0249854 A1	12/2004	Barnes-Leon et al.
6,850,895 B2	2/2005	Brodersen et al.	2004/0260534 A1	12/2004	Pak et al.
6,850,949 B2	2/2005	Warner et al.	2004/0260659 A1	12/2004	Chan et al.
7,062,502 B1	6/2006	Kesler	2004/0268299 A1	12/2004	Lei et al.
7,181,758 B1	2/2007	Chan	2005/0050555 A1	3/2005	Exley et al.
7,289,976 B2	10/2007	Kihneman et al.	2005/0091098 A1	4/2005	Brodersen et al.
7,340,411 B2	3/2008	Cook	2006/0021019 A1	1/2006	Hinton et al.
7,356,482 B2	4/2008	Frankland et al.	2006/0023859 A1 *	2/2006	Crockett ..... H04M 3/42153 379/212.01
7,401,094 B1	7/2008	Kesler	2007/0185957 A1 *	8/2007	Mandalia ..... H04L 65/4007 709/204
7,412,455 B2	8/2008	Dillon	2008/0249972 A1	10/2008	Dillon
7,508,789 B2	3/2009	Chan	2009/0063414 A1	3/2009	White et al.
7,620,655 B2	11/2009	Larsson et al.	2009/0100342 A1	4/2009	Jakobson
7,698,160 B2	4/2010	Beaven et al.	2009/0177744 A1	7/2009	Marlow et al.
7,779,475 B2	8/2010	Jakobson et al.	2010/0246800 A1 *	9/2010	Geppert ..... G06F 3/04817 379/265.09
8,014,943 B2	9/2011	Jakobson	2012/0047517 A1 *	2/2012	Townsend ..... H04M 3/5191 719/313
8,015,495 B2	9/2011	Achacoso et al.	2012/0233137 A1	9/2012	Jakobson et al.
8,032,297 B2	10/2011	Jakobson	2013/0218948 A1	8/2013	Jakobson
8,082,301 B2	12/2011	Ahlgren et al.	2013/0218949 A1	8/2013	Jakobson
8,095,413 B1	1/2012	Beaven	2013/0218966 A1	8/2013	Jakobson
8,095,594 B2	1/2012	Beaven et al.			
8,209,308 B2	6/2012	Rueben et al.			
8,275,836 B2	9/2012	Beaven et al.			

\* cited by examiner

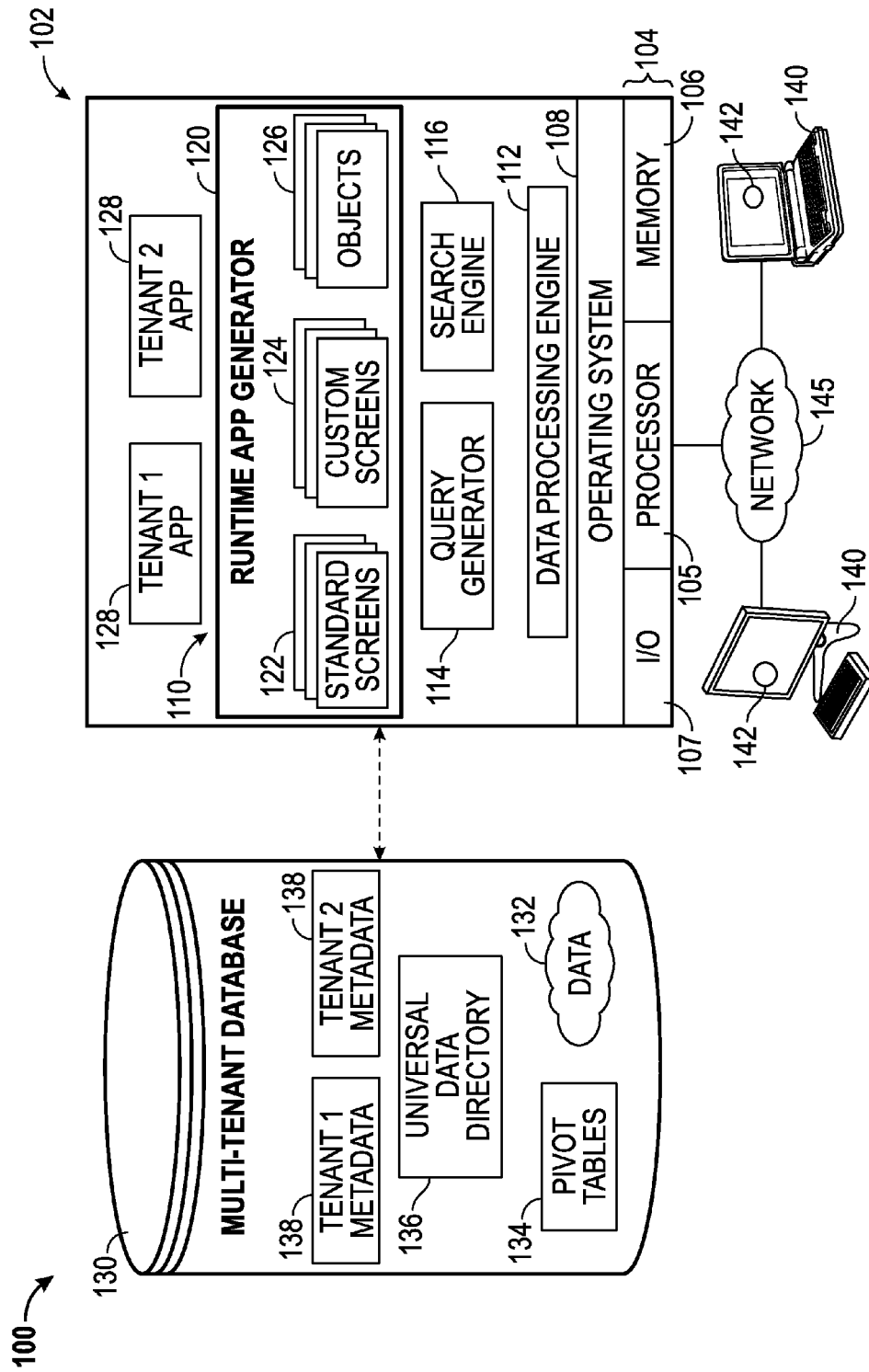


FIG. 1

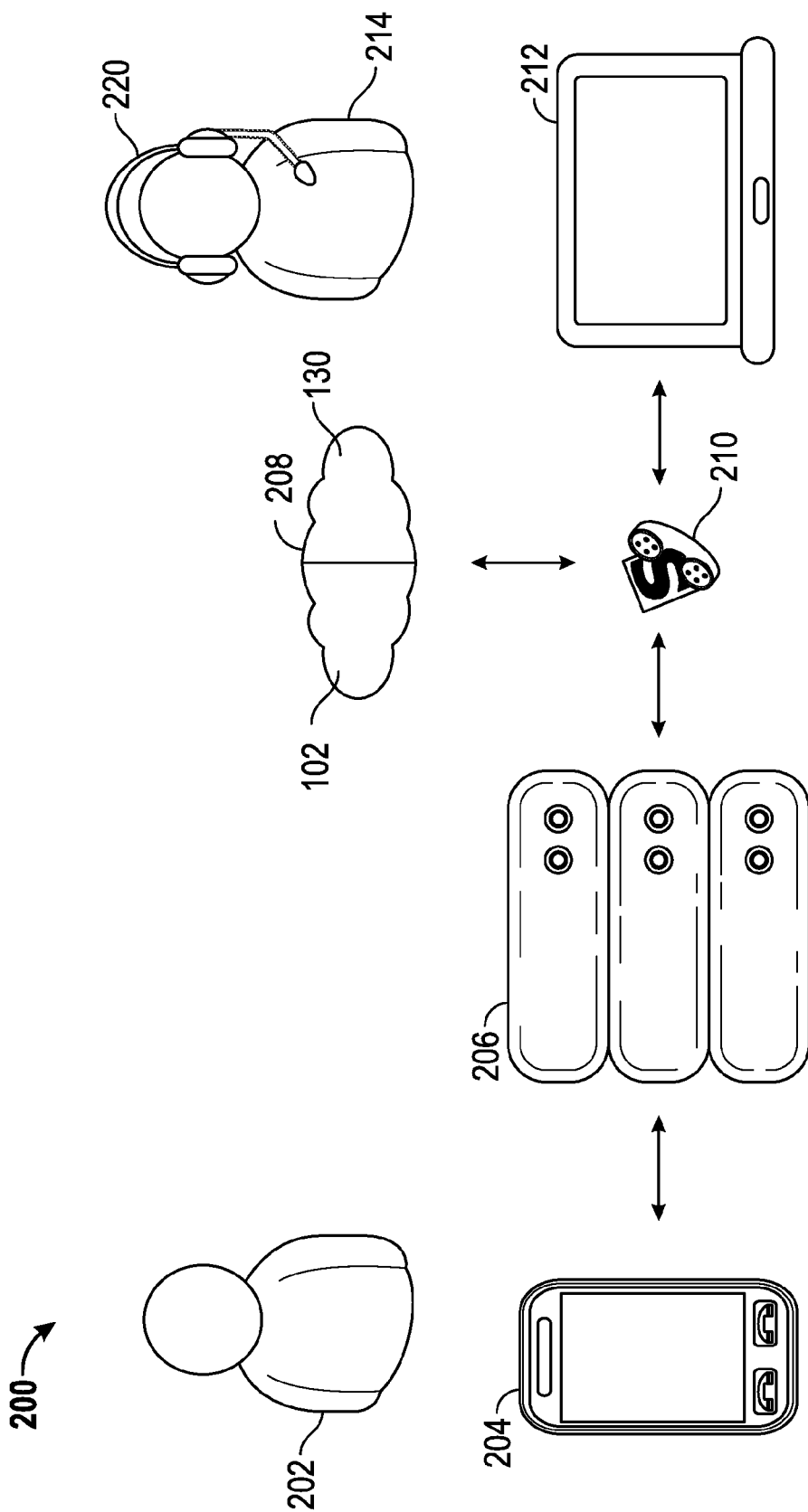
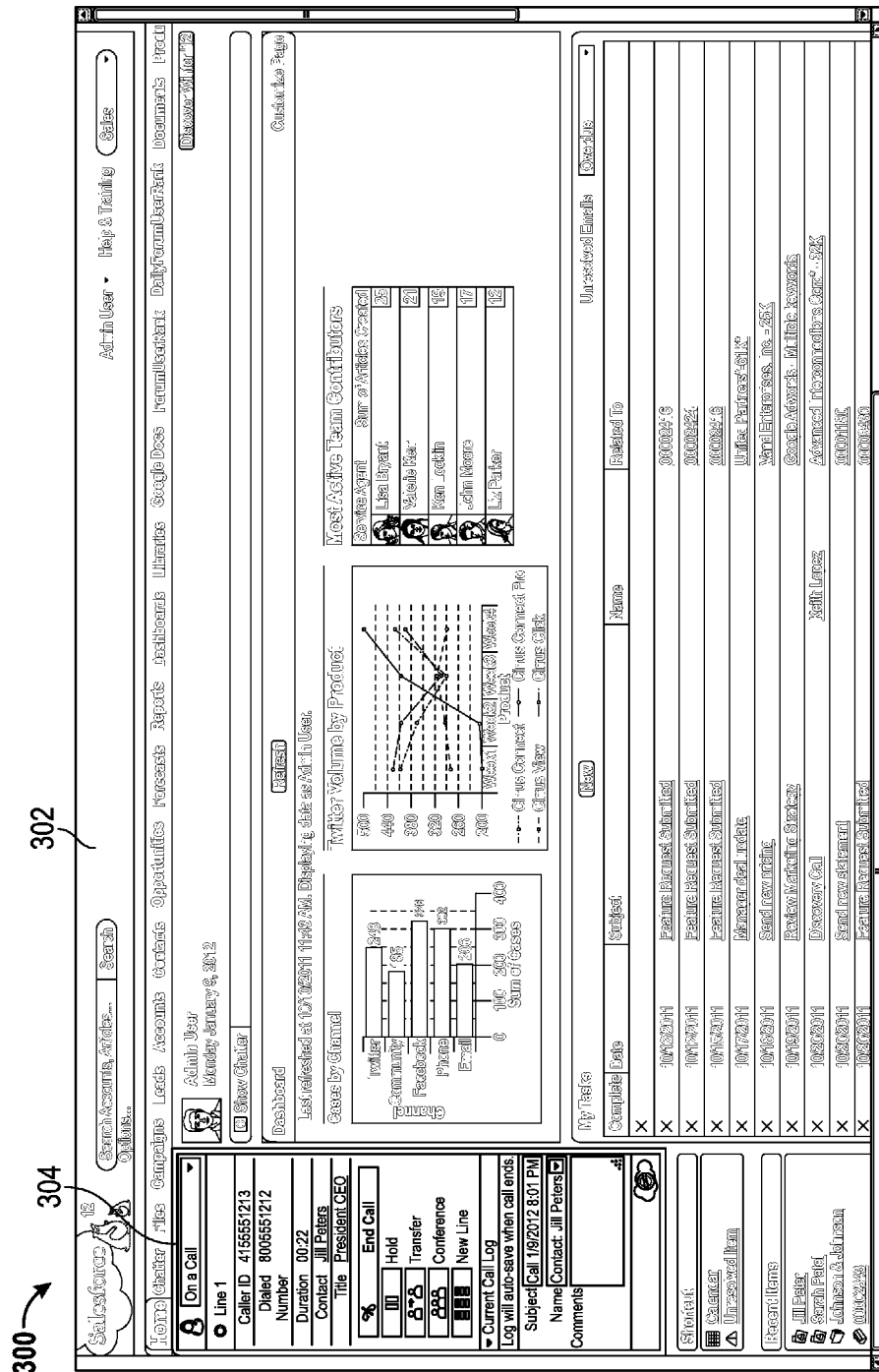


FIG. 2



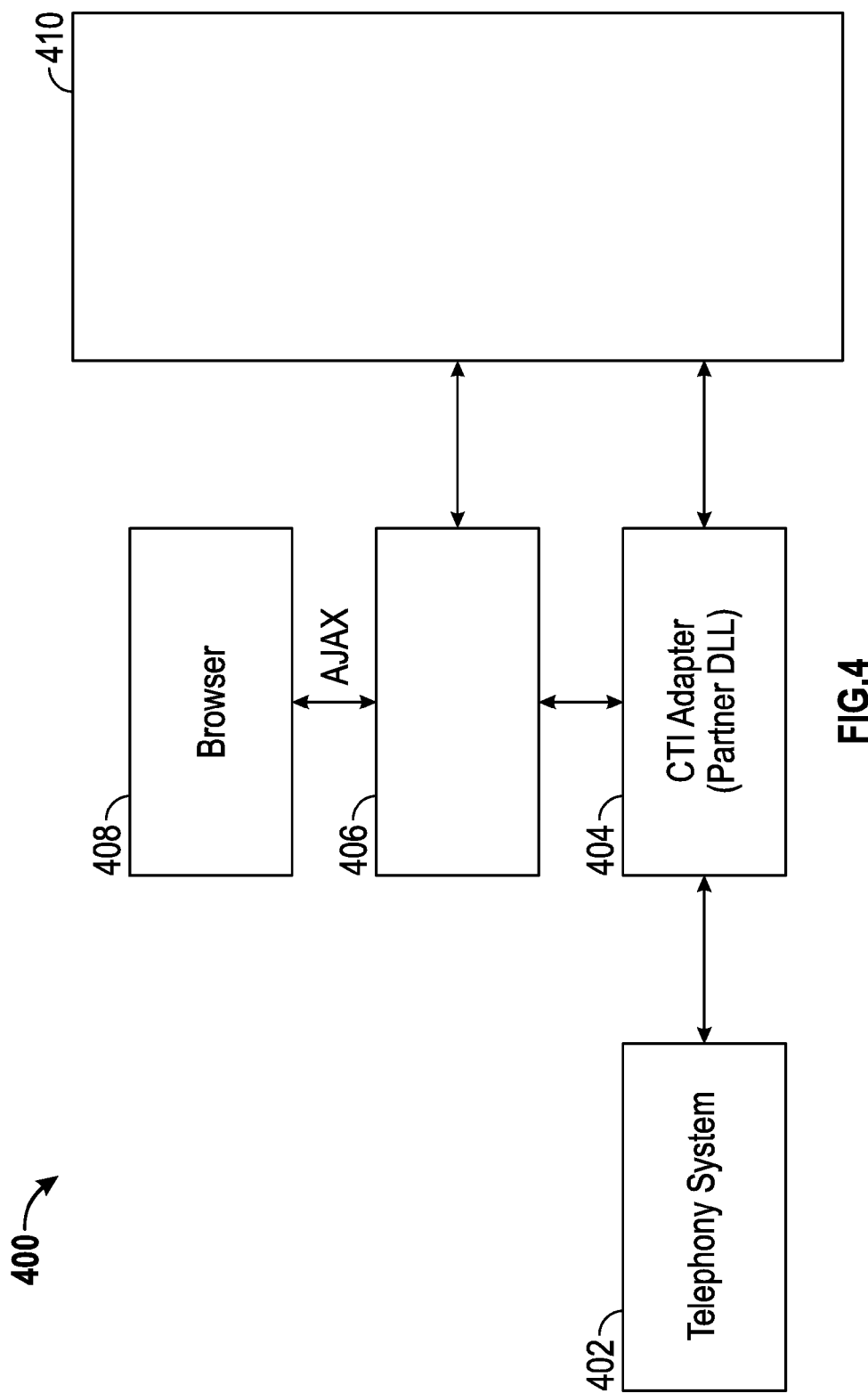


FIG. 4

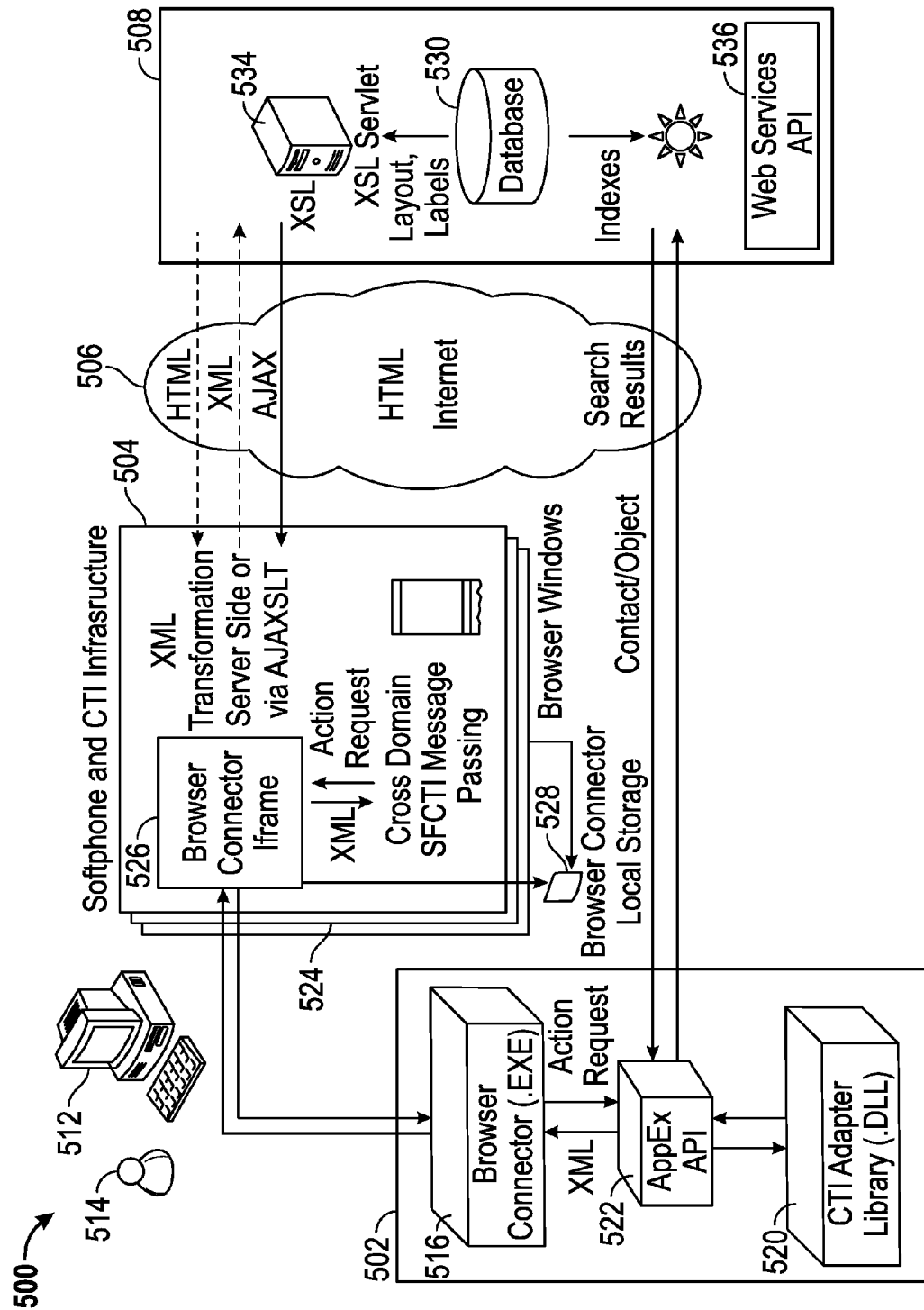


FIG. 5

1

## METHODS AND SYSTEMS FOR PARTIALLY UPDATING A WEB PAGE USING AN EMBEDDED IFRAME

### CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation of, and claims priority to, U.S. application Ser. No. 13/604,356, filed Sep. 5, 2012, and claims the benefit of U.S. provisional patent application Ser. No. 61/594,209, filed Feb. 2, 2012, the entire contents of which are incorporated by reference herein.

### TECHNICAL FIELD

Embodiments of the subject matter described herein relate generally to computer systems and applications for customer relationship management and, more particularly, to a communications architecture for securely updating a web-based user interface with telephony information using an embedded iFrame.

### BACKGROUND

Modern software development is evolving away from the client-server model toward network-based processing systems that provide access to data and services via the Internet or other networks. In contrast to traditional systems that host networked applications on dedicated server hardware, a “cloud” computing model allows applications to be provided over the network “as a service” supplied by an infrastructure provider. The infrastructure provider typically abstracts the underlying hardware and other resources used to deliver a customer-developed application so that the customer no longer needs to operate and support dedicated server hardware. The cloud computing model can often provide substantial cost savings to the customer over the life of the application because the customer no longer needs to provide dedicated network infrastructure, electrical and temperature controls, physical security and other logistics in support of dedicated server hardware.

Multi-tenant cloud-based architectures have been developed to improve collaboration, integration, and community-based cooperation between customer tenants without sacrificing data security. Generally speaking, multi-tenancy refers to a system where a single hardware and software platform simultaneously supports multiple user groups (also referred to as “organizations” or “tenants”) from a common data storage element (also referred to as a “multi-tenant database”). The multi-tenant design provides a number of advantages over conventional server virtualization systems. First, the multi-tenant platform operator can often make improvements to the platform based upon collective information from the entire tenant community. Additionally, because all users in the multi-tenant environment execute applications within a common processing space, it is relatively easy to grant or deny access to specific sets of data for any user within the multi-tenant platform, thereby improving collaboration and integration between applications and the data managed by the various applications. The multi-tenant architecture therefore allows convenient and cost effective sharing of similar application features between multiple sets of users.

Robust customer relationship management (CRM) systems and applications have been developed for use in the multi-tenant environment. Presently known CRM applications typically include a web-based component and a tele-

2

phony component. The web-based component presents a customer service representative (CSR) with a dash board-style user interface which summarizes information pertaining to an incoming call, such as the caller’s name, title, company affiliation, location, nature and priority of the customer service inquiry, incident history, and the like.

### BRIEF DESCRIPTION OF THE DRAWINGS

A more complete understanding of the subject matter may be derived by referring to the detailed description and claims when considered in conjunction with the following figures, wherein like reference numbers refer to similar elements throughout the figures.

FIG. 1 is a schematic block diagram of an exemplary multi-tenant computing environment

FIG. 2 is a schematic block diagram of an exemplary architecture for integrating a telephony application into a customer relationship management (CRM) system;

FIG. 3 is a web page screen shot of an exemplary softphone window supported by a hidden iFrame in accordance with one or more embodiments;

FIG. 4 is a schematic block diagram of an exemplary computer telephony integration (CTI) application for use with a CRM system; and

FIG. 5 is a schematic block diagram illustrating various details of the softphone and computer telephony integration (CTI) infrastructure associated with the CRM desktop application shown in FIG. 3.

### DETAILED DESCRIPTION

Embodiments of the subject matter described herein generally relate to a computer telephony integration (CTI) application for use with a customer relationship management (CRM) system in the context of a multitenant computing environment.

Turning now to FIG. 1, an exemplary multi-tenant system 100 includes a server 102 that dynamically creates and supports virtual applications 128 based upon data 132 from a database 130 that may be shared between multiple tenants, referred to herein as a multi-tenant database. Data and services generated by the virtual applications 128 are provided via a network 145 to any number of client devices 140, as desired. Each virtual application 128 is suitably generated at run-time (or on-demand) using a common application platform 110 that securely provides access to the data 132 in the database 130 for each of the various tenants subscribing to the multi-tenant system 100. In accordance with one non-limiting example, the multi-tenant system 100 is implemented in the form of an on-demand multi-tenant customer relationship management (CRM) system that can support any number of authenticated users of multiple tenants.

As used herein, a “tenant” or an “organization” should be understood as referring to a group of one or more users that shares access to common subset of the data within the multi-tenant database 130. In this regard, each tenant includes one or more users associated with, assigned to, or otherwise belonging to that respective tenant. Stated another way, each respective user within the multi-tenant system 100 is associated with, assigned to, or otherwise belongs to a particular one of the plurality of tenants supported by the multi-tenant system 100. Tenants may represent companies, corporate departments, business or legal organizations, and/or any other entities that maintain data for particular sets of users (such as their respective customers) within the multi-tenant system 100. Although multiple tenants may share



access to the server **102** and the database **130**, the particular data and services provided from the server **102** to each tenant can be securely isolated from those provided to other tenants. The multi-tenant architecture therefore allows different sets of users to share functionality and hardware resources without necessarily sharing any of the data **132** belonging to or otherwise associated with other tenants.

The multi-tenant database **130** may be a repository or other data storage system capable of storing and managing the data **132** associated with any number of tenants. The database **130** may be implemented using conventional database server hardware. In various embodiments, the database **130** shares processing hardware **104** with the server **102**. In other embodiments, the database **130** is implemented using separate physical and/or virtual database server hardware that communicates with the server **102** to perform the various functions described herein. In an exemplary embodiment, the database **130** includes a database management system or other equivalent software capable of determining an optimal query plan for retrieving and providing a particular subset of the data **132** to an instance of virtual application **128** in response to a query initiated or otherwise provided by a virtual application **128**, as described in greater detail below. The multi-tenant database **130** may alternatively be referred to herein as an on-demand database, in that the multi-tenant database **130** provides (or is available to provide) data at run-time to on-demand virtual applications **128** generated by the application platform **110**, as described in greater detail below.

In practice, the data **132** may be organized and formatted in any manner to support the application platform **110**. In various embodiments, the data **132** is suitably organized into a relatively small number of large data tables to maintain a semi-amorphous “heap”-type format. The data **132** can then be organized as needed for a particular virtual application **128**. In various embodiments, conventional data relationships are established using any number of pivot tables **134** that establish indexing, uniqueness, relationships between entities, and/or other aspects of conventional database organization as desired. Further data manipulation and report formatting is generally performed at run-time using a variety of metadata constructs. Metadata within a universal data directory (UDD) **136**, for example, can be used to describe any number of forms, reports, workflows, user access privileges, business logic and other constructs that are common to multiple tenants. Tenant-specific formatting, functions and other constructs may be maintained as tenant-specific metadata **138** for each tenant, as desired. Rather than forcing the data **132** into an inflexible global structure that is common to all tenants and applications, the database **130** is organized to be relatively amorphous, with the pivot tables **134** and the metadata **138** providing additional structure on an as-needed basis. To that end, the application platform **110** suitably uses the pivot tables **134** and/or the metadata **138** to generate “virtual” components of the virtual applications **128** to logically obtain, process, and present the relatively amorphous data **132** from the database **130**.

The server **102** may be implemented using one or more actual and/or virtual computing systems that collectively provide the dynamic application platform **110** for generating the virtual applications **128**. For example, the server **102** may be implemented using a cluster of actual and/or virtual servers operating in conjunction with each other, typically in association with conventional network communications, cluster management, load balancing and other features as appropriate. The server **102** operates with any sort of conventional processing hardware **104**, such as a processor **105**,

memory **106**, input/output features **107** and the like. The input/output features **107** generally represent the interface(s) to networks (e.g., to the network **145**, or any other local area, wide area or other network), mass storage, display devices, data entry devices and/or the like. The processor **105** may be implemented using any suitable processing system, such as one or more processors, controllers, microprocessors, micro-controllers, processing cores and/or other computing resources spread across any number of distributed or integrated systems, including any number of “cloud-based” or other virtual systems. The memory **106** represents any non-transitory short or long term storage or other computer-readable media capable of storing programming instructions for execution on the processor **105**, including any sort of random access memory (RAM), read only memory (ROM), flash memory, magnetic or optical mass storage, and/or the like. The computer-executable programming instructions, when read and executed by the server **102** and/or processor **105**, cause the server **102** and/or processor **105** to create, generate, or otherwise facilitate the application platform **110** and/or virtual applications **128** and perform one or more additional tasks, operations, functions, and/or processes described herein. It should be noted that the memory **106** represents one suitable implementation of such computer-readable media, and alternatively or additionally, the server **102** could receive and cooperate with external computer-readable media that is realized as a portable or mobile component or platform, e.g., a portable hard drive, a USB flash drive, an optical disc, or the like.

The application platform **110** is any sort of software application or other data processing engine that generates the virtual applications **128** that provide data and/or services to the client devices **140**. In a typical embodiment, the application platform **110** gains access to processing resources, communications interfaces and other features of the processing hardware **104** using any sort of conventional or proprietary operating system **108**. The virtual applications **128** are typically generated at run-time in response to input received from the client devices **140**. For the illustrated embodiment, the application platform **110** includes a bulk data processing engine **112**, a query generator **114**, a search engine **116** that provides text indexing and other search functionality, and a runtime application generator **120**. Each of these features may be implemented as a separate process or other module, and many equivalent embodiments could include different and/or additional features, components or other modules as desired.

The runtime application generator **120** dynamically builds and executes the virtual applications **128** in response to specific requests received from the client devices **140**. The virtual applications **128** are typically constructed in accordance with the tenant-specific metadata **138**, which describes the particular tables, reports, interfaces and/or other features of the particular application **128**. In various embodiments, each virtual application **128** generates dynamic web content that can be served to a browser or other client program **142** associated with its client device **140**, as appropriate.

The runtime application generator **120** suitably interacts with the query generator **114** to efficiently obtain multi-tenant data **132** from the database **130** as needed in response to input queries initiated or otherwise provided by users of the client devices **140**. In a typical embodiment, the query generator **114** considers the identity of the user requesting a particular function (along with the user’s associated tenant), and then builds and executes queries to the database **130** using system-wide metadata **136**, tenant specific metadata

138, pivot tables 134, and/or any other available resources. The query generator 114 in this example therefore maintains security of the common database 130 by ensuring that queries are consistent with access privileges granted to the user and/or tenant that initiated the request.

With continued reference to FIG. 1, the data processing engine 112 performs bulk processing operations on the data 132 such as uploads or downloads, updates, online transaction processing, and/or the like. In many embodiments, less urgent bulk processing of the data 132 can be scheduled to occur as processing resources become available, thereby giving priority to more urgent data processing by the query generator 114, the search engine 116, the virtual applications 128, etc.

In exemplary embodiments, the application platform 110 is utilized to create and/or generate data-driven virtual applications 128 for the tenants that they support. Such virtual applications 128 may make use of interface features such as custom (or tenant-specific) screens 124, standard (or universal) screens 122 or the like. Any number of custom and/or standard objects 126 may also be available for integration into tenant-developed virtual applications 128. As used herein, “custom” should be understood as meaning that a respective object or application is tenant-specific (e.g., only available to users associated with a particular tenant in the multi-tenant system) or user-specific (e.g., only available to a particular subset of users within the multi-tenant system), whereas “standard” or “universal” applications or objects are available across multiple tenants in the multi-tenant system. The data 132 associated with each virtual application 128 is provided to the database 130, as appropriate, and stored until it is requested or is otherwise needed, along with the metadata 138 that describes the particular features (e.g., reports, tables, functions, objects, fields, formulas, code, etc.) of that particular virtual application 128. For example, a virtual application 128 may include a number of objects 126 accessible to a tenant, wherein for each object 126 accessible to the tenant, information pertaining to its object type along with values for various fields associated with that respective object type are maintained as metadata 138 in the database 130. In this regard, the object type defines the structure (e.g., the formatting, functions and other constructs) of each respective object 126 and the various fields associated therewith.

Still referring to FIG. 1, the data and services provided by the server 102 can be retrieved using any sort of personal computer, mobile telephone, tablet or other network-enabled client device 140 on the network 145. In an exemplary embodiment, the client device 140 includes a display device, such as a monitor, screen, or another conventional electronic display capable of graphically presenting data and/or information retrieved from the multi-tenant database 130, as described in greater detail below. Typically, the user operates a conventional browser application or other client program 142 executed by the client device 140 to contact the server 102 via the network 145 using a networking protocol, such as the hypertext transport protocol (HTTP) or the like. The user typically authenticates his or her identity to the server 102 to obtain a session identifier (“SessionID”) that identifies the user in subsequent communications with the server 102. When the identified user requests access to a virtual application 128, the runtime application generator 120 suitably creates the application at run time based upon the metadata 138, as appropriate. As noted above, the virtual application 128 may contain Java, ActiveX, or other content that can be presented using conventional client software running on the client device 140; other embodiments may

simply provide dynamic web or other content that can be presented and viewed by the user, as desired. As described in greater detail below, the query generator 114 suitably obtains the requested subsets of data 132 from the database 130 as needed to populate the tables, reports or other features of the particular virtual application 128.

In accordance with one embodiment, application 128 may be a customer relationship management (CRM) system of the type which includes a computer telephony integration (CTI) application, often referred to as a “softphone”. A typical CRM architecture includes an interactive web application and a CTI module which work together to create a seamless browser experience including softphone component. The web application includes a dash board interface for presenting aggregate customer information to a customer service representative (CSR), and for managing incoming customer service calls; the CTI module communicates with the telephony hardware and renders the “softphone” inside the browser window.

Presently known CTI modules are designed to route an incoming call to a CSR by inserting (e.g., overlaying) an interactive softphone window into the web page being viewed by the CSR. When an incoming customer service call is received, the softphone displays a graphical, textual, or numeric icon to alert the CSR to answer the call. The CSR may then ‘click’ on the softphone graphic to answer and service the call. In one such system, the CTI component employs Microsoft’s ShellDocView utility to select a browser page from an Internet Explorer™ compliant library, and to insert hyper-text transfer protocol language (HTML) and associated functionality directly into the browser page along with a softphone graphic (e.g., a softphone window) into the IE browser session served up by the web application.

This approach is advantageous in that it has no network delay; however, it presents a security vulnerability to the extent it injects HTML directly into the web page. Moreover, the ShellDocView library is limited in that it is designed to be used only with the Internet Explorer browser.

In accordance with one embodiment of the present disclosure, a localhost model is employed, meaning that all communication between the CTI application and the web application is local to the CSR desktop. That is, while the CRM application executes on the network cloud, the desktop does not need to reach out over the Internet or to a local intranet to facilitate communication between the telephony application and the browser windows served up by the web application. In this context, the term “desktop” means the local computer used by the CRS to service the customer service call, and can include a traditional desktop computer, laptop, notebook, hand-held, or any other type of computing device which presents a web based CRM application to the CSR and which includes a telephony component for refreshing the softphone in the context of the browser experience.

Referring now to FIG. 2, an exemplary customer relationship management system 200 includes a computer telephony integration executable (CTI.exe) module 206, a web-based softphone application 210, a computing cloud 208 which includes server 102 and database 130, and a customer service representative (CSR) 214 equipped with a telephony headset 220 and a CSR desktop computer monitor 212. A customer 202 places a customer service call using a customer telephone 204, and is routed to CSR 214 as described below.

CTI.exe 206 is configured to run locally on the CSR desktop, and to serve both the telephony application which interfaces with customer telephone 204, as well as the

softphone component **210** which is integrated into the user interface presented to the CSR **214** via monitor **212**. In particular, CTI.exe **206** is configured to communicate with the iFrame which supports the softphone component **210** within the web page served by cloud **208**.

FIG. 3 illustrates an exemplary graphical user interface **300** including a softphone graphic **304** such as an iFrame-supported window which is embedded, overlaid, superimposed, or otherwise presented within a web page **302**, for example, a dash board style summary of customer information relating to customer service calls.

FIG. 4 is a logical block diagram of a CTI.exe module **406** which interfaces with a telephony system **402** using, for example, a CTI adapter library **404**. CTI.exe **406** is also configured to communicate with a web-based CRM application, for example, a browser application **408**. As explained in greater detail below, CTI.exe **406** is configured to pass updated call status information to browser **408** and facilitate the integration of the updated call status information with customer information from a customer database **410**.

Telephony system **402** may be in the form of an enterprise platform, a midmarket platform, an on-demand platform, a system integrator platform, or a combination or hybrid of the foregoing. Presently known enterprise platform providers include Avaya™, Cisco™, Genesys™, Aspect™, Siemens™, Nortel™, Alcatel™, Rockwell™, and NEC™. Presently known midmarket platform providers include ShoreTel™, Interactive Intelligence™, Ericsson™, Linksys™, Vertical™, 3Com™, Asterisk™, and Mitel™. Presently known on-demand providers include Liveops™, inContact™, Contactual™, Five9™, Echopass™, Teamphone™, Angel.com™, and Skype™. Presently known system integrators include Syntellect™, SimpliCTI™, AMC Technology™, BCE Elix™, and ilink™.

In an embodiment, adapter library **404** includes an adapter for each possible provider of telephony platform **402**. In this way, CTI.exe **406** may operate seamlessly with any one of a plurality of telephony systems in a manner which is transparent to the caller **202** and the CSR **214**. That is, by selecting the appropriate adapter from the adapter library, the look and feel of the browser experience from the perspective of the CSR is consistent across a range of telephony providers.

With continued reference to FIG. 4, CTI.exe **406** may be agnostic to the browser; that is, the look and feel of the CRM application browser experience may also be consistent across a range of browsers such as, for example, Internet Explorer™ (IE8+), Chrome™, Opera™, Firefox™, and Safari™ (to the extent they support HTML5 post message functionality). To accomplish this, various embodiments of the desktop application utilize asynchronous Javascript and XML (Ajax) messaging protocols to embed the softphone graphic via an iFrame into the web page.

Turning now to FIG. 5, an embodiment of a customer relationship management (CRM) architecture **500** includes a telephony module **502**, a softphone and CTI infrastructure module **504**, an Internet connectivity cloud **506**, and a data service module **508**. Data service module **508** may include a web services application programming interface (API) **536** to facilitate web-based communication with telephony module **502**, an aggregate customer database **530**, and a data server **534**.

Telephony module **502** includes a CTI adapter library **520**, a telephony API **522** for communicating with data module **508** through cloud **506**, and a browser connector module **516**. Browser connector module **516** is configured to exchange Ajax messages with softphone/CTI module **504** to

communicate with the iFrame which supports the softphone window in the web page, as described in greater detail below.

With continued reference to FIG. 5, softphone/CTI infrastructure module **504** includes a browser connector local storage **528** which serves a plurality of browser compliant web pages **524**, and a browser connector iFrame which uses Ajax protocols or equivalent technology to insert a softphone graphic in the form of an iFrame into the web page as needed (for example, to alert the CSR of an incoming call). Softphone/CTI infrastructure module **504** further uses XML for exchanging customer information with data service module **508** via cloud **506**.

Softphone/CTI infrastructure module **504** is implemented as a localhost service and is thus capable of implementing the functions associated with CTI.exe **206** in a desktop environment. That is, module **504** retrieves incoming call information and displays the call in an iFrame within a web page, without having to reach out beyond the desktop. This reduces or eliminates the network delay associated with most implementations by using cross domain communication, allowing real time interaction of both the telephony system and the web application within a seamless browser experience.

A system, including a computer telephony integration (CTI) application, for managing customer service calls on a desktop computer is provided. The application includes a first module which serves a web-based application configured to present a user with a browser window having an embedded softphone, and a second module which serves a communication application configured to receive message status information from a message adapter and forward the message status information to the softphone, wherein the first and second modules may be implemented as a single, integrated code base stored in a non-transitory computer readable storage medium for execution by the desktop computer.

The first module may be configured to operate in a network domain such as an on-demand network computing platform, and the second module may be configured to operate in a desk top domain. Communication between the first and second domains is substantially or wholly local to the desktop computer, i.e., the application does not need to access the Internet or a local intranet to facilitate interaction between the web application and the telephony application. For example, the softphone may function as a pop-up window within the web-based application operating in the first domain, whereas the second module implements the functions of a browser connector for the telephony application in the second domain.

In one embodiment of the system, the browser connector is configured to establish communication with an iFrame which supports a softphone window embedded in the browser. In this way, both the softphone window (which is observable by the user) and the hidden iFrame which supports the softphone may be refreshed (updated) to reflect a change in the status of a message (such as a change in call status), for example, by using a JavaScript message such as an asynchronous JavaScript and XML (Ajax) protocol.

Upon a change in the status of a customer service call or other message, such as the receipt or termination of an incoming call, the message adapter (e.g., CTI adapter) is configured to pass a call status message to the browser connector, and the browser connector is configured to update the iFrame to reflect the status change. For example, the iFrame may be updated to notify the customer service representative that an incoming call or other message has

been received, to thereby prompt the customer service representative to answer the call or otherwise process the incoming message.

A customer relationship management (CRM) system for use with a desktop computer is also provided. The system includes an adapter library having a plurality of messaging adapters including computer telephony integration (CTI) adapters for a plurality of telephony service providers; a browser connector configured to exchange messages with one of the adapters; local storage stored within a plurality of CRM browser windows; and a web application configured to display the browser windows and to communicate with the browser connector. As a practical matter, only one adapter is typically used at one time, inasmuch as a particular call service center would likely use a single telephony service provider; hence, it is appropriate for the telephony providers to develop their own individual adapters to work in conjunction with published CTI specifications.

In an embodiment, the adapter(s) and the CTI application comprise a single, integrated code base stored on and executable by the desktop computer. The web application is suitably served by a computing cloud on a network, and is configured to present a customer service representative (CSR) with a user interface (e.g., a dash board-style graphical user interface (GUI)) which summarizes information pertaining to customer service calls. The information may include one or more of the following: the caller's name, title, company affiliation, location, nature and priority of the customer service inquiry, and the incident history.

Communication between the web application and the browser connector may be controlled by a single, integrated set of computer executable instructions residing on and executed by the desktop computer. In this way, communication between the browser connector and the web application may be primarily (or exclusively) local to the desktop computer. Thus, for example, upon a change in the status of a customer service call, the browser connector may update the iFrame to reflect the status change without having to access the Internet (or intranet).

Also provided is a method of partially refreshing a user interface associated with a computer telephony integration (CTI) application running on a desktop computer, the method including serving, from a network cloud, a web-based application configured to present a softphone to a user on a computer display (monitor); serving, from the desktop computer, a telephony application configured to exchange customer service call information with a CTI adapter; and passing call status information from the CTI application to the softphone using an embedded iFrame. The method further includes refreshing the iFrame upon a change of said call status information.

The foregoing description is merely illustrative in nature and is not intended to limit the embodiments of the subject matter or the application and uses of such embodiments. Furthermore, there is no intention to be bound by any expressed or implied theory presented in the technical field, background, or the detailed description. As used herein, the word "exemplary" means "serving as an example, instance, or illustration." Any implementation described herein as exemplary is not necessarily to be construed as preferred or advantageous over other implementations, and the exemplary embodiments described herein are not intended to limit the scope or applicability of the subject matter in any way.

For the sake of brevity, conventional techniques related to computer programming, computer networking, database querying, database statistics, query plan generation, XML and other functional aspects of the systems (and the indi-

vidual operating components of the systems) may not be described in detail herein. In addition, those skilled in the art will appreciate that embodiments may be practiced in conjunction with any number of system and/or network architectures, data transmission protocols, and device configurations, and that the system described herein is merely one suitable example. Furthermore, certain terminology may be used herein for the purpose of reference only, and thus is not intended to be limiting. For example, the terms "first", "second" and other such numerical terms do not imply a sequence or order unless clearly indicated by the context.

Embodiments of the subject matter may be described herein in terms of functional and/or logical block components, and with reference to symbolic representations of operations, processing tasks, and functions that may be performed by various computing components or devices. Such operations, tasks, and functions are sometimes referred to as being computer-executed, computerized, software-implemented, or computer-implemented. In this regard, it should be appreciated that the various block components shown in the figures may be realized by any number of hardware, software, and/or firmware components configured to perform the specified functions. For example, an embodiment of a system or a component may employ various integrated circuit components, e.g., memory elements, digital signal processing elements, logic elements, look-up tables, or the like, which may carry out a variety of functions under the control of one or more microprocessors or other control devices. In this regard, the subject matter described herein can be implemented in the context of any computer-implemented system and/or in connection with two or more separate and distinct computer-implemented systems that cooperate and communicate with one another. That said, in exemplary embodiments, the subject matter described herein is implemented in conjunction with a virtual customer relationship management (CRM) application in a multi-tenant environment.

While at least one exemplary embodiment has been presented in the foregoing detailed description, it should be appreciated that a vast number of variations exist. It should also be appreciated that the exemplary embodiment or embodiments described herein are not intended to limit the scope, applicability, or configuration of the claimed subject matter in any way. Rather, the foregoing detailed description will provide those skilled in the art with a convenient road map for implementing the described embodiment or embodiments. It should be understood that various changes can be made in the function and arrangement of elements without departing from the scope defined by the claims, which includes known equivalents and foreseeable equivalents at the time of filing this patent application. Accordingly, details of the exemplary embodiments or other limitations described above should not be read into the claims absent a clear intention to the contrary.

What is claimed is:

1. A system for a desktop computer, comprising:

- a first module serving a web-based application configurable to present a user with a browser window having an embedded component, wherein said first module is configurable to operate in a first domain comprising an on-demand network computing platform; and
- a second module serving a communication application configurable to receive message status information from a message adapter and forward said message status information to said embedded component, wherein said second module is configurable to operate in a second domain comprising a desktop environment;

## 11

wherein communication between said first and said second domains is local to said desktop computer; and wherein said first and second modules comprise an integrated code base stored in a non-transitory computer readable storage medium in said desktop environment.

2. The system of claim 1, wherein said embedded component is configured as a pop-up window.

3. The system of claim 1, wherein said second module functions as a browser connector for said communication application.

4. The system of claim 3, wherein said web application includes an iFrame for supporting said embedded component, and said browser connector is configurable to communicate with said iFrame.

5. The system of claim 4, wherein said browser connector is configurable to pass call status information to said embedded component using said iFrame.

6. The system of claim 4, wherein said browser connector is configured to update said iFrame to reflect an incoming customer service message using a JavaScript message.

7. The system of claim 4, wherein said Javascript message is an asynchronous JavaScript and XML (Ajax) protocol compliant message.

8. The system of claim 4 wherein, upon receipt of an incoming customer service message:

said adapter is configurable to pass an incoming message to said browser connector;

said browser connector is configurable to update said iFrame to reflect said incoming message; and

said iFrame is configurable to update said embedded component to reflect said incoming message.

9. A customer relationship management system for use with a desktop computer, comprising:

a message adapter;

a browser connector configured to exchange messages with said adapter;

a plurality of CRM browser windows; and

a web application configured to display said CRM browser windows and to communicate with said browser connector;

wherein said browser connector is stored on and executable by said desktop computer;

wherein said browser connector comprises an integrated set of computer executable instructions residing on and executable by said desktop computer; and

## 12

wherein communication between said browser connector and said web application is local to said desktop computer.

10. The customer relationship management system of claim 9, wherein said browser connector is configured to communicate with an embedded iFrame in at least one of said CRM browser windows.

11. The customer relationship management system of claim 10, wherein said communication is implemented using asynchronous JavaScript and XML (Ajax) protocols.

12. The customer relationship management system of claim 9, wherein said web application is configured to present a customer service representative (CSR) with a user interface which summarizes information pertaining to customer service calls.

13. The customer relationship management system of claim 12, wherein said information includes at least one of the following: the caller's name, title, company affiliation, location, nature and priority of the customer service inquiry, and incident history.

14. The customer relationship management system of claim 9 wherein, upon a change in status of a customer service call, said browser connector is configured to update said iFrame to reflect said status change.

15. A method of partially refreshing a user interface associated with an application running on a desktop computer, the method comprising:

serving, from a network cloud, a web-based application configurable to present a browser window having an embedded component to a user on a computer monitor, wherein the web-based application is configurable to operate in a first domain;

serving, from said desktop computer, a communication application configurable to exchange message information with a message adapter, wherein the communication application is configurable to operate in a second domain; and

passing the message information from said message adapter to said embedded component using an embedded iFrame, wherein the passing of the message information between the first domain and the second domain is local to said desktop computer.

16. The method of claim 15 further comprising refreshing said iFrame upon a change of said message information.

\* \* \* \* \*